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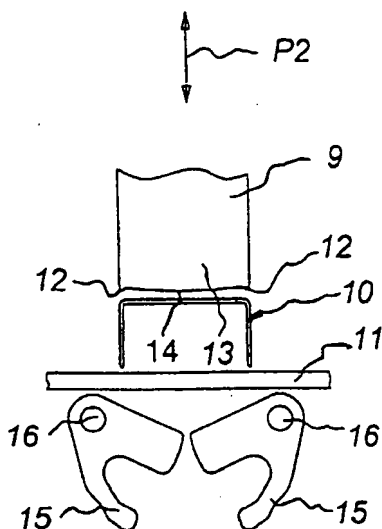
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(54) Title: STAPLE DRIVER WITH CONVEX EDGE AND POINTED PROTRUSIONS AT THE ENDS



(57) Abstract: A staple driver (9) is adapted to be mounted in a stapler for driving staples into a sheaf of papers (11) in order to drive, in a striking motion, the legs of a U-shaped staple (10) through the sheaf of papers (11). The driver (9) has a plate-shaped portion (13) with an edge surface (14) which is arranged, in the striking motion, to be applied and pressed against the web portion of the staple (10). The staple driver (9) has pointed projections (12) which are arranged to engage, in the striking motion, with the web portion of the staple (10) in front of the legs of the staple. The edge surface (14) of the driver (9) extends in its longitudinal direction along an outwardly curved arc.

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Staple driver with convex edge and pointed protrusions at the ends

The present invention relates to a staple driver which is adapted to be mounted in a stapler for driving staples into a sheaf of papers to eject a U-shaped staple and drive its legs through the sheaf of papers in a striking motion, the striking motion being directed perpendicular to the web portion of the staple, said driver having a plate-shaped portion with an edge surface whose width is essentially equal to the thickness of the staple and which is arranged, in the striking motion, to be applied and pressed against the web portion of the staple.

In prior-art staplers, use is made of a magazine which either contains straight wire staple blanks which are juxtaposed and releasably interconnected to form a strip of staple blanks, or contains U-shaped staples which are arranged closely together in a long row. In the former case, the stapler has a shaper as well as a driver. As stapling is carried out by means of the stapler, the strip of staple blanks is advanced step by step to the shaper which in a striking motion shapes the straight staple blank, which is in a shaping position, to a U-shaped staple. This U-shaped staple is advanced by the step-by-step advancing of the strip to a driving position in front of the driver, which in a striking motion releases the staple from the strip and drives its legs into a sheaf of papers. In the latter case, i.e. when the magazine contains U-shaped staples, shaping need, of course, not take place. The stapler then has no shaper but a driver which operates in the fashion described above.

A prior-art driver and the manner in which it drives a U-shaped staple into a sheaf of papers will now be described with reference to Figs 1A-1F.

Figs 1A-1F show a portion of a staple driver 1 which consists of a metal plate having essentially the same thickness as the U-shaped staple 2 which is to be driven into a sheaf of papers 3. The driver 1 is arranged in a stapler (not shown) reciprocating in the direction of the double arrow P1.

The staple driver 1 has at its side edges projections 4 projecting in the direction of the staple 2. The projections 4 are pointed and each located in front of one of the two legs 2" of the staple 2 arranged in the driving position, so as to engage with the web portion 2' of the staple 2 in front of the legs 2" as the staple 2 is being driven in. The driver 1 also has a portion 5 located between the projections 4 and having an edge surface 6 facing the staple 2.

The stapler also has a clinching mechanism which comprises two clinching means 7 each of which is turnable on a pivot 8 which is perpendicular to the plane of the staple 2, and each of which is arranged to cooperate with a leg 2" of the staple 2.

When the staple driver 1 in a striking motion is moved in the direction of the staple 2, its two pointed projections 4 will engage with the web portion 2' of the staple 2 in front of the legs 2". The projections 4 bite into the web portion 2', the edge surface 6 of the portion 5 of the driver 1 being applied and pressed against the web portion 2' in order to drive, during the continued striking motion of the driver 1, the legs 2" through the sheaf of papers 3 until the web portion 2' comes into abutment against the upper side thereof (see Fig. 1C). When the staple legs 2" are driven through the sheaf of papers 3, they strike against the clinching means 7 arranged in a first turning position and are bent slightly towards each other (see Fig. 1C). The driver 1 is retained in the position shown in Fig. 1C, and the clinching means 7 are turned to a second turning position (Fig. 1D) while they bend the staple legs 2" further into

abutment against the underside of the sheaf of papers 3, i.e. to a position in which the legs 2" extend parallel with the sheaf of papers 3. Subsequently the clinching means 7 are turned back to the first turning position while the driver 1 is retained in its position with the edge surface 6 pressed against the web portion 2' of the staple 2 (Fig. 1E). Finally, the driver 1 is returned to its starting position shown in Figs 1A and 1F.

When the staple 2, as is usually the case, is made of a metal wire, it can, after completion of driving and clinching, be deformed somewhat in that the staple legs 2" spring out a distance from the underside of the sheaf of papers 3 in the manner shown in Fig. 1F. This results in the staple 2 obtaining a considerably greater thickness, seen in the driving direction of the staple, than in the clinched position shown in Fig. 1E. This increase in thickness is of course not desirable. For instance, it causes trouble when a plurality of sheaves of an arbitrary number of stapled sheets of paper are inserted in a file since the thickness of the entire sheaf will be considerably much greater in the upper left corner where the staples are usually arranged when stapling together sheets of paper. Moreover, there is a great risk of the user being torn by the projecting leg ends.

The object of the present invention is to provide, in view of that stated above, a staple driver which eliminates the above problems caused by the resilience properties of the staple material.

According to the invention, this object is achieved by a staple driver, which is of the type mentioned by way of introduction, being given the distinctive features defined in claim 1, i.e. that in combination with the feature known per se that the staple driver has pointed projections which are arranged to engage, in the striking motion, with the web portion of the staple in front of the legs of the staple, it has the feature that the edge

surface in its longitudinal direction extends along an outwardly curved arc.

The edge surface preferably is of essentially the same length as the web portion of the staple and is preferably arcuate over its entire length.

The invention will now be described in more detail with reference to the accompanying drawings, in which

Figs 1A-1F show a portion of the prior-art staple driver described above, and

Figs 2A-2F illustrate a portion of a staple driver according to the present invention.

The staple driver 9 of which a portion is shown in Figs 2A-2F consists of a metal sheet which has essentially the same thickness as the U-shaped staple 10 which is made of metal wire and which is to be driven into a sheaf of papers 11. The driver 9 is arranged in a stapler (not shown) reciprocating in the direction of the double arrow P2.

The staple driver 9 has at its side edges projections 12 projecting in the direction of the staple 10. The projections 12 are pointed and each positioned in front of one of the two legs 10' of the staple 10 located in the driving position, in order to engage with the web portion 10' of the staple 10 in front of the legs 10", when driving in the staple 10. The driver 9 also has a portion 13, which is located between the projections 12 and has an edge surface 14 facing the staple 10. The edge surface 14 has essentially the same length as the web portion 10' of the staple 10 and extends in its longitudinal direction along an outwardly curved arc. In the shown, preferred embodiment, the edge surface 14 is arcuate over its entire length.

The stapler also has a clinching mechanism which comprises two clinching means 15 which are turnable on a pivot 16 each, which is perpendicular to the plane of the staple 10, and are each arranged to cooperate with one of the legs 10" of the staple 10.

When the staple driver 9 in a striking motion is moved in the direction of the staple 10, its two pointed projections 12 will engage with the web portion 10' of the staple 10 in front of the legs 10". The projections 12 bite into the web portion 10', the edge surface 14 of the portion 13 of the driver 9 being applied and pressed against the web portion 10' in order to drive, during the continued striking motion of the driver 9, the legs 10" through the sheaf of papers 11 until the web portion 10' comes into abutment against the upper side thereof (see Fig. 2C). The web portion 10' of the staple 10 will then be given the arcuate shape defined by the edge surface (see Figs 2C-2E). When the legs 10" are driven through the sheaf of papers 11, they strike against the clinching means 15 placed in a first turning position and are bent slightly towards each other (see Fig. 2C). The driver 9 is retained in the position shown in Fig. 2C and the clinching means 15 are turned to a second turning position (Fig. 2D) while they bend the staple legs 10" further into abutment against the underside of the sheaf of papers 11, i.e. to a position in which the legs 10" extend parallel with the sheaf of papers 11. Subsequently, the clinching means 15 are turned back to the first turning position while the driver 9 is retained in its position with the edge surface 14 pressed against the web portion 10' of the staple 10 (Fig. 2E). Finally, the driver 9 is returned to the starting position shown in Figs 2A and 2F.

When the staple driver 9 has left the staple 10 which has been driven in and clinched, the web portion 10' thereof springs back and becomes straight while at the same time the staple legs 10" at their free ends are pressed a distance into the sheaf of papers 11 at the underside thereof (see Fig. 2F). As a result, the above-described outwards springing of the staple legs from the underside of the sheaf of papers does not take place, in contrast to the prior-art staple driver (see Fig. 1F).

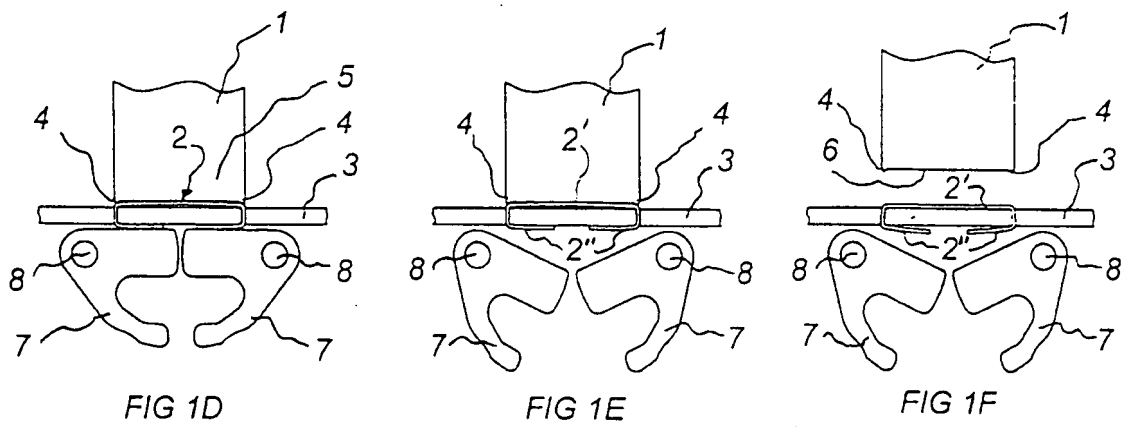
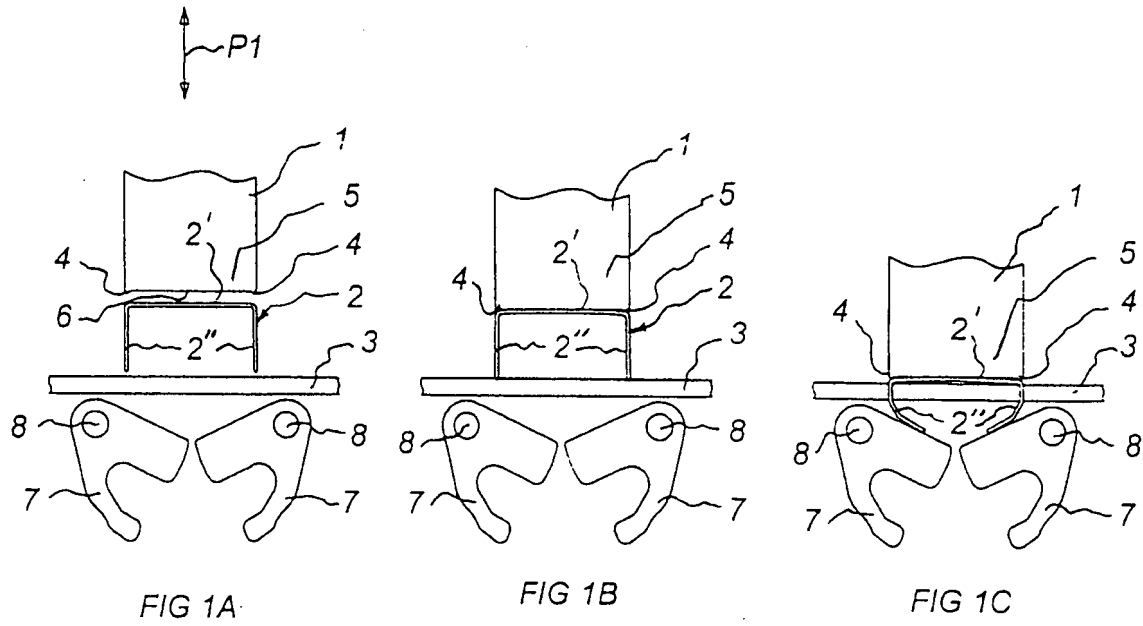
## CLAIMS

1. A staple driver which is adapted to be mounted in  
5 a stapler for driving staples into a sheaf of papers (11)  
to eject a U-shaped staple (10) and drive its legs (10")  
through the sheaf of papers in a striking motion, the  
striking motion being directed perpendicular to the web  
portion (10') of the staple (10), said driver having a  
10 plate-shaped portion (13) with an edge surface (14) whose  
width is essentially equal to the thickness of the staple  
(10) and which is arranged, in the striking motion, to be  
applied and pressed against the web portion (10') of the  
staple (10), c h a r a c t e r i s e d in that the staple  
15 driver has pointed projections (12) which are arranged  
to engage, in the striking motion, with the web portion  
(10') of the staple (10) in front of the legs (10") of  
the staple (10), and that the edge surface (14) in its  
longitudinal direction extends along an outwardly curved  
20 arc.

2. A staple driver as claimed in claim 1, c h a r -  
a c t e r i s e d in that the edge surface (14) is of  
essentially the same length as the web portion (10') of  
the staple (10).

25 3. A staple driver as claimed in claim 1 or 2,  
c h a r a c t e r i s e d in that the edge surface (14)  
is arcuate over its entire length.

1/2





2/2

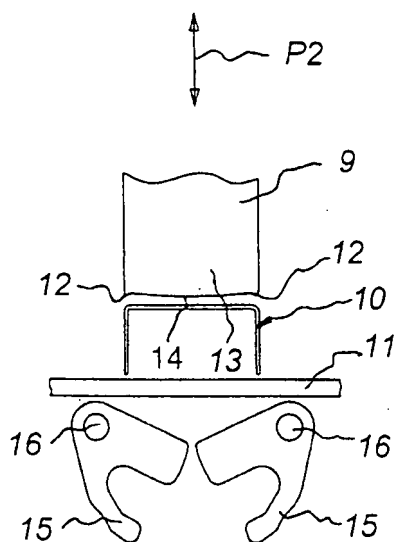


FIG 2A

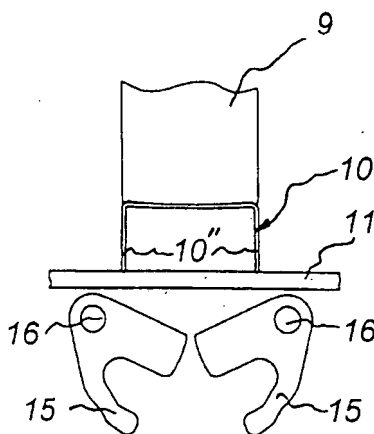


FIG 2B

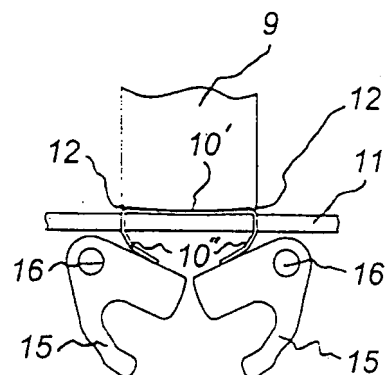


FIG 2C

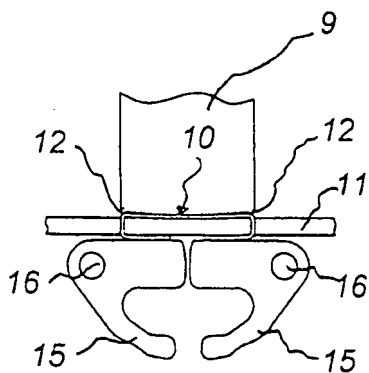


FIG 2D

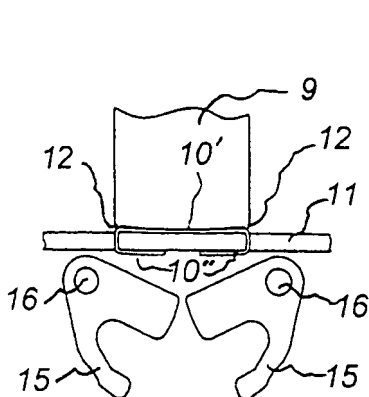


FIG 2E

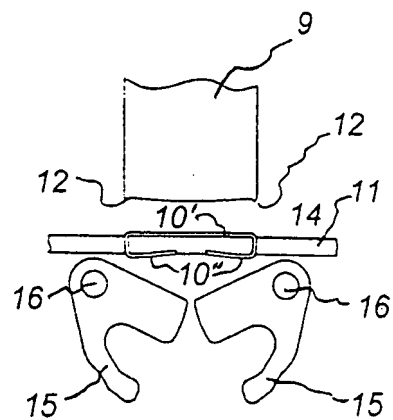


FIG 2F

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01960

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B25C 5/00, B27F 7/17

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B25C, B27F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 4747531 A (RONALD J. BRINKERHOFF ET AL), 31 May 1988 (31.05.88), column 8, line 15 - line 39, figure 5 --	1-3
Y	SE 506725 C2 (ISABERG RAPID AB), 2 February 1998 (02.02.98), page 6, line 26 - line 33, figure 3 --	1-3
A	SE 511482 C2 (JOSEF KIHLEBERG AB), 4 October 1999 (04.10.99), figure 2 --	1-3
A	US 2066157 A (WILLIAM G. PANKONIN), 29 December 1936 (29.12.36), figure 21 --	1-3

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

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Date of the actual completion of the international search

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

International application No.

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

International application No.

04/12/00

PCT/SE 00/01960

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